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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/739,620	12/20/2000	Noriaki Oda	Q61572	4739

7590

12/03/2002

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EXAMINER

NGUYEN, HA T

ART UNIT	PAPER NUMBER
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2812

DATE MAILED: 12/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/739,620	ODA, NORIAKI	
	Examiner	Art Unit	
	Ha T. Nguyen	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5,7-11 and 25-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5,7-11 and 25-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>10</u> . | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

Notice to applicant

1. Applicants' Amendment and Response to the Office Action mailed 3-7-02 has been entered and made of record (Paper No. 12).

Response to Amendment

2. In view of Applicants' cancellation of the claims, the rejection of claim 3 and objection to claim 6 have been rendered moot.

In view of Applicants' arguments and amendment to the claims, the rejection of claims 1, 2, 7-11 and 25 under 102 or 103 as being anticipated by or unpatentable over Geffken, Lee (US Patent 6171960), Mori et al. (US Patent 6303495, hereinafter "Mori ") alone or in combination with other references as stated in Paper No.9 , has been withdrawn.

In view of new art found, the objection to claims 4 and 5 has been withdrawn.

Applicants are referred to the new ground of rejection given below.

Claim Rejections - 35 USC § 112

3. Claims 10 and 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 10 and 31 recite "the bottom" in lines 6 and 4, respectively, and "the top" in lines 9 and 6, respectively.

There is not enough antecedent basis for these limitations in the claims.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103[©] and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1, 2, 4, 5, 7-9, 25-30, and 33 are rejected under 35 U.S.C. 102^{3(a)}(b) as being unpatentable over Mizushima (JP 590262) in view of Farkas et al. (US Patent 6001730, hereinafter "Farkas").

[Claims 1, 2, 4, 5, 25-27, and 33] Referring to Figs. 1A-1D and related text, Mizushima discloses a semiconductor device comprising: a substrate 1 having a surface; a dielectric 7 formed over the surface of the substrate; and a wiring line buried in the dielectric layer; the wiring line including a conductor 14 and first cover layer 11 covering an outer surface of the conductor; the first cover layer being made of refractory metal containing compound (see constitution); wherein the first cover layer entirely covers the outer surface of the conductor, note that the examiner interprets the outer surface of the conductor to be the surface surrounding the conductor; a third cover layer 13 provided between the conductor and the first cover layer; wherein the second cover layer covers entirely or partially the outer surface of the conductor; wherein the third cover layer covers entirely or partially the outer surface of the conductor, the third cover layer being made of dielectric. But it does not disclose expressly that the conductor is of Cu-based, the first cover layer is of refractory metal nitride, a second cover layer of refractory metal is provided between the conductor and the first cover layer. However, the missing limitations are well known in the art because Farkas discloses the use of Cu conductor 28 and a diffusion layer for Cu could be a combination of layers of Ta, TaN, TaSiN...etc (See col. 4, lines 48-58) when Farkas combination of layers, for example TaN and Ta, is used as diffusion barrier in place of conductive film designated as numeral 11 in Mizushima, all the limitations of the claims are met. A person of ordinary skill is motivated to modify Mizushima with Farkas for better protection against diffusion of Cu.

[Claims 7-9 and 28-30] Farkas also discloses wherein the dielectric formed over the surface of the substrate is made of inorganic material and has a relative dielectric constant ranging from 1.6 to 9; of organic material and has a relative dielectric constant ranging from 1.6 to 3; and wherein the wiring line has a damascene structure (see Fig. 4 and col. 4, lines 12-47).

Therefore, it would have been obvious to combine Mizushima with Farkas to obtain the invention as specified in claims 1, 2, 4, 5, 7-9, 25-30, and 33.

6. Claims 10 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizushima in view of Farkas, as applied to claims 1, 2, 4, 5, 7-9, 25-30, and 33 above, and further in view of Mori et al. (U.S. Patent 6303495, hereinafter "Mori").

The combined teaching of Mizushima and Farkas discloses substantially the limitations of claims 10 and 31, as shown above. Farkas also discloses wherein the dielectric in which the wiring line is buried has a composite structure comprising a first dielectric layer 16, an etch stop layer 18 formed on the first dielectric layer, and a second dielectric layer 20 formed on the etch stop layer.

But it does not disclose wherein the bottom of the first cover layer is approximately in a same level as an upper surface of the first dielectric layer and the top of the first cover layer is approximately in the same level as an upper surface of the second dielectric layer.

However, the missing limitations are well known in the art because Mori discloses these features (see fig. 9, #18a, 19a, 18b).

A person of ordinary skill is motivated to modify Mizushima and Farkas with Mori to obtain better prevention of Cu diffusion from the wiring to the surrounding environment.

Therefore, it would have been obvious to combine Mizushima and Farkas with Mori to obtain the invention as specified in claims 10 and 31.

7. Claims 11 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizushima in view of Farkas, as applied to claims 1, 2, 4, 5, 7-9, 25-30, and 33 above, and further in view of Nogami et al. (U.S. Patent 6214731, hereinafter "Nogami").

The combined teaching of Mizushima and Farkas discloses substantially the limitations of claims 11 and 32, as shown above.

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But it does not disclose expressly a via hole of tapered shape with the claimed slope.

However, the missing limitation is well known in the art because Nogami discloses this feature (See fig. 1A).

A person of ordinary skill is motivated to modify Mizushima and Farkas with Nogami to obtain better filling of the contact hole.

Therefore, it would have been obvious to combine Mizushima and Farkas with Nogami to obtain the invention as specified in claims 11 and 32.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha Nguyen whose telephone number is (703)308-2706 . The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling, can be reached on (703) 308-3325. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703)308-0956.



Ha Nguyen

Primary Examiner

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